

AMENDMENTS TO THE SPECIFICATION

Please replace the ABSTRACT on a separate page as amended below:

The present invention provides a peptide sequence, a phage, an artificial protein or a chimeric molecule having a binding ability to titanium, silver, silicon, necessary to confer higher capacity of titanium, silver, silicon material with the use of soft matters, or to provide a complex of a peptide, a phage, an artificial protein or a chimeric molecule, and titanium, having the peptide sequence and functional peptide sequence. By bringing into contact a population of phage wherein said phage of said population collectively express a library of different peptide sequence, recovering titanium bound to phage particles via peptide sequence by centrifugation, proliferating the obtained phage particles in bacteria, and repeating panning operation and concentrating titanium binding phage clones. Among the phage clones, peptide RKLDPAPGMHTW (SEQ ID NO: 3) and the like is identified. As for a peptide having a binding ability to titanium, silver, silicon, RKLPGA (SEQ ID NO: 1) or RALPGA (SEQ ID NO: 2) can be exemplified.

Please amend the specification at page 17, paragraph 4 as follows:

The most left part shows the clone name, and the expressing sequence is shown beside by a single letter notation of the amino acid. The amino acid sequences of the peptides shown in Fig. 3 correspond to SEQ ID NOs: 3 and 16 to 24.

Please amend the specification at page 17, paragraph 5 as follows:

Fig. 4 is a picture showing an amino acid sequence of a peptide expressed by the obtained clone after repeating 3 times the panning of titanium particles by using C7C phage library. The amino acid sequences of the peptides shown in Fig. 4 correspond to SEQ ID NOs: 3 and 25 to 38.

Please amend the specification at page 18, paragraph 3 as follows:

Fig. 8 is a picture showing the base sequences (SEQ ID NOs: 4 to 14) of the primer used in the Examples.

Please amend the specification at page 18, paragraph 4 as follows:

The “alphabet-number-alphabet” shown in the left of the first paragraph of the figure, represents the mutant name prepared by using the primer. The origin of the name is as follows: sequence e3-2-3 (SEQ ID NO: 3) is represented by a single letter notation of the amino acid, the position of the amino acid residue from the amino terminal is represented by a number, and the last letter “A” shows the substitution by alanine. For example, P4A represents a primer used to substitute the 4th praline from N terminal of SEQ ID NO: 3 by alanine.

Please amend the specification at page 18, paragraph 5 as follows:

Next, $\Delta 7$ -12F (SEQ ID NO: 51), $\Delta 7$ -12R (SEQ ID NO: 52) and K2A $\Delta 7$ -12R (SEQ ID NO: 53) are primers used to prepare deletion mutants explained in Example 5. They were used to PCR, with the combination of $\Delta 7$ -12F and $\Delta 7$ -12R; $\Delta 7$ -12F and K2A $\Delta 7$ -12R.

Please amend the specification at page 18, paragraph 6 as follows:

Ala insert (SEQ ID NO: 54) is a primer used to prepare insert mutant explained in Example 6.

Please amend the specification at page 20, paragraph 7 as follows:

Fig. 18 is a picture showing a pattern diagram of the construction of a ferritin-expressing vector fusing a peptide comprising an amino acid sequence shown in SEQ ID NO: 1. Base sequence of the synthetic DNA encoding the Ti-binding sequence is shown in SEQ ID NO: 55 and base sequence of the synthetic DNA encoding polypeptide MRKLPDPA is shown in SEQ ID NO: 56.

Please amend the specification at page 42, paragraph 1 as follows:

The deletion mutants were prepared by the method shown schematically in FIG. 10. Double stranded DNA of each phage clone (herein after referred to as RF) was prepared by using QIAGEN kit. PCR was performed by making the obtained RF as a matrix. To the primer used (FIG. 8, SEQ ID NOs: 51 to 53), poly G sequence of 3 residues was added to 5'-terminal side so that cleavage with restriction enzyme BamHI cleavage site and BamHI is possible at 5'-

terminal side. As for reagent, ExpandTM Long Template PCR System (~~Behringer~~) (Boehringer) was used, ~~and the~~ ExpandTM Long Template PCR System is composed of (1) an enzyme mix containing thermostable Taq DNA polymerase and Tgo DNA polymerase; and (2) a buffer. The reaction was performed with 100 µl solution comprising 1 µl polymerase, 10 µl 10x buffer solution 2 attached, 8 µl 2.5 mM dNTPs, 1 µl each of primer each 100 pmole/µl, and 0.5 µl RF. PCR reaction was performed for 30 cycles of 30 sec at 94 °C, 30 sec at 60 °C, 6 min at 72 °C. Furthermore, before the cycle, 5 min-preheat was performed at 94 °C, and after the cycle, the mixture was incubated for 7 min at 72 °C. After the PCR reaction, the product was separated by 1% agarose gel electrophoresis, and the band around 7 kb which is of the intended size was cut off under UV, and by using Geneclean II kit (Funakoshi), the band was purified according to the attached protocol. The purified DNA was incubated at 30 °C for 2 hours with restriction enzyme BamHI (~~Behringer~~) (Boehringer). Then, BamHI was inactivated by ethanol precipitation to dry DNA. The dried DNA was dissolved into 4 µl of sterile water and 5 µl of 2x ligation buffer (Promega). Then, 1 µl of T4 DNA ligase (Roche) was added, ligation reaction was performed at room temperature for 30 min for self-ring closure. To the reaction solution, 100 µl of competent cells of *E. coli* ER2738 strain described in Example 1 was added, the mixture was left stand on ice for 30 min, and after adding heat shock of 42 °C for 40 sec was put immediately on ice for 3 min. Then, 800 µl of SOC medium was added, cultured by shaking aggressively for 3 hours at 37 °C. Then, 1, 10, 100 µl was mixed with 200 µl of ER2738 strain in logarithmic growth phase, and left stand for 5 min. Afterwards, the resultant was cloned according to a common procedure (Molecular Cloning Third Edition, Cold Spring Harbor Laboratory Press). The introduction of deletion was confirmed by sequencing the phage DNA sequence. DNA sequencing was performed in the same manner as Example 1. The binding ability to titanium of the obtained

point mutants was measured by the method shown in Example 2, by adjusting the phage amount added to 10^{10} pfu. The binding ability to titanium of both deletion mutants are shown in FIG. 11. From FIG. 11, it has been revealed that phage clone expressing a peptide shown in SEQ ID NO: 1 that binds to titanium bind with the same strength for 1 to 6th in the first part.